



U.S. Army photo

Leading the way: 50 years of GI seismology

On March 27, 1964, the University of Alaska Fairbanks Geophysical Institute was 18 years old. Alaska had become a state just five years earlier. Two of the world's oldest seismic instruments had been in operation in Alaska for more than 25 years, in Fairbanks and Sitka. The Fairbanks site, College Station, was part of the first collaboration to systematically instrument the globe. Plate tectonics was just a burgeoning theory. And then the second-largest earthquake ever recorded, magnitude 9.2, shook Alaska and the scientific world.

In the years following the great earthquake, Alaska became a focus for earthquake research. Primed with a plethora of new data, the GI flourished while partnering with the United States Geological Survey and what is now the National Tsunami Warning Center to lead this research boom. Pioneering scientists began refining theories about how Earth works. Several of today's high-profile earthquake research topics, such as tectonic tremor and episodic slip, have roots in Alaska.

"It ushered in an era of major geological and geophysical field investigations and created a generation of scientists steeped in north Pacific tectonics," said State Seismologist Michael West. "Scientifically, the 1964 earthquake put Alaska on the map."

In 1987, the State of Alaska, by state statute, created what is now the Alaska Earthquake Center at the University of Alaska Fairbanks' Geophysical Institute. John Davies became the first Alaska state seismologist. In 1989, the USGS and the Alaska Earthquake Center merged their operations.

Today, the Earthquake Center, National Tsunami Warning Center, Alaska Volcano Observatory and the National Earthquake Information Center provide integrated monitoring of the different facets of Alaska earthquakes. "It cannot be overstated, however, that the career efforts, the infrastructure investments, and the political will to achieve what exists today began on 27 March 1964," said West.

The Alaska Earthquake Center

The Alaska Earthquake Center and its staff of 20 is charged with providing rapid, authoritative information to state and federal agencies, the public, industry and Alaska’s emergency operations centers about Alaska’s 30,000 annual earthquakes and their human impacts. The Earthquake Center, through UAF, is a founding member of the Incorporated Research Institutions for Seismology consortium, through which data is distributed openly to support global monitoring and research.

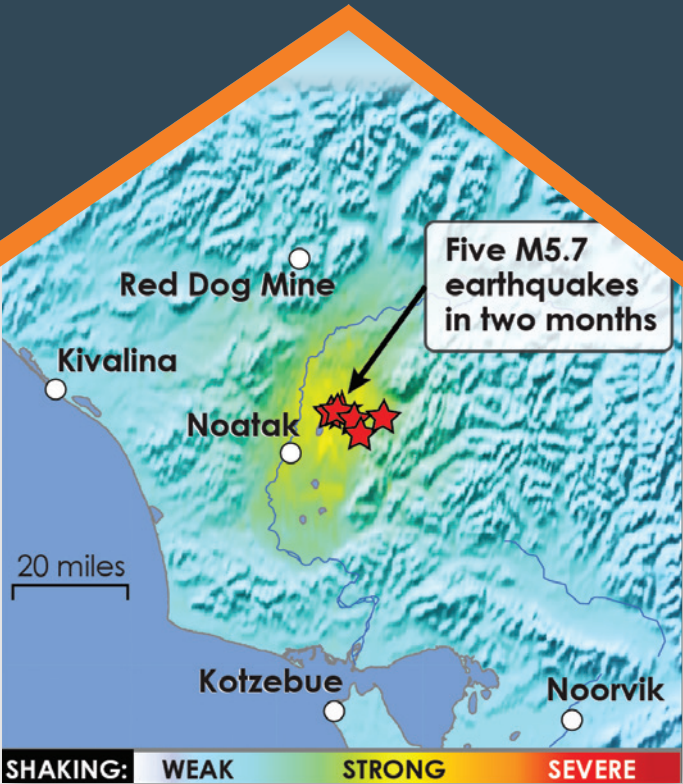


Field work

Field technicians, postdocs, and graduate students are responsible for monitoring station performance and maintaining the real-time data acquisition systems for the center’s seismic sites. In the event of a significant earthquake, the Earthquake Center can respond quickly with temporary instruments to supplement existing coverage and talk with local residents. In May 2014, field technician Christopher Bruton placed two such instruments in the Noatak region. “The residents seemed excited and were incredibly helpful,” Bruton said.

Monitoring

Real-time data is processed through an automatic detection system. Seismologist Natasha Ruppert said, “Initial event locations are calculated and uploaded to the website within two to five minutes of the earthquake, with refined locations updated as needed.” A “duty seismologist” is on call 24/7 to track daily earthquake activity and, when necessary, disseminate information. The Earthquake Center’s data analysts are responsible for refining automatic locations and distinguishing earthquakes from glacial calving events, landslides and mine blasts, all of which are cataloged in the center’s database.



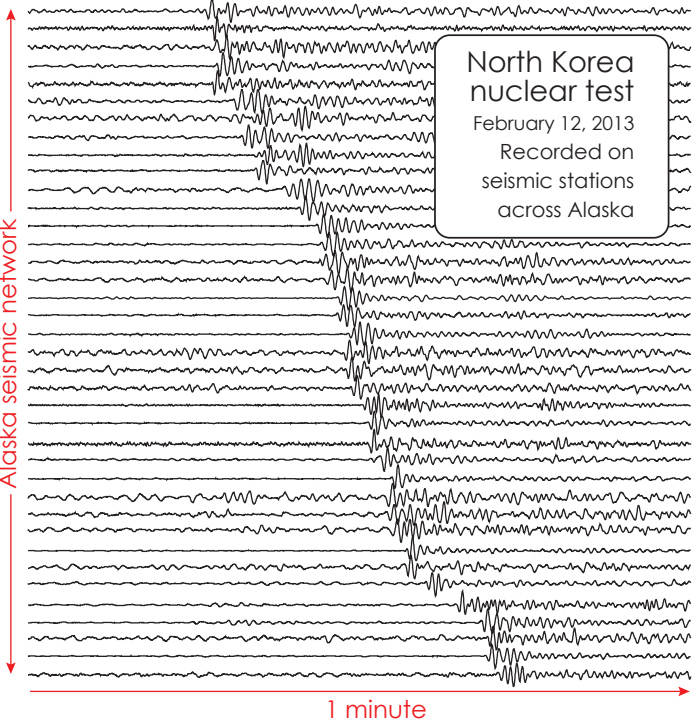
SHAKING GROUND— Above is a map showing the intensity of shaking in the Noatak, Alaska, region during the 2014 earthquake swarm. Researchers analyze seismic data to distinguish earthquake events from other sources of shaking ground, both natural and manmade.

IN THE FIELD— Installing and maintaining seismic stations in Alaska takes field workers to remote and beautiful locations. Pictured left to right from the top, opposite page: (1) Scott Dalton installs a radio antenna in the region around the proposed Susitna-Watana Dam; (2) Dara Merz wires a digitizer to a seismometer in Atka, Alaska; (3) Vipul Sikwal and Scott Dalton install new batteries at Sherman Glacier; (4) Berg Lake seismic station, above Steller Glacier, is a solar-powered, mountaintop installation; (5) Scott Dalton and Christopher Bruton adjust a satellite data transmitter to send real-time data back to the center; (6) Sara Meyer installs a new power controller at a seismic station on Anvil Mountain near Nome; (7) hiking, at times through snow, is sometimes required for station maintenance.

Data products and support

The center’s data products include maps of earthquake shaking in a region. “They offer a clear, easy way for the public and engineers to interpret high-level information without too many technical details,” stated seismologist Matt Gardine. These maps are useful for earthquake scenario planning. They can be generated using hypothetical events to forecast shaking. These estimates of shaking are the foundation for estimating infrastructure damage and potential fatalities.

Other products include data to help engineers in Anchorage and Fairbanks assess ground stability and partnerships with major infrastructure such as the Alyeska pipeline, the Bradley Lake Dam and the Susitna-Watana proposed dam site to assess prospective earthquake threats.



NUCLEAR— A seismogram displays man-made shaking as a result of the North Korea nuclear test in 2013 as recorded across the Alaska network.

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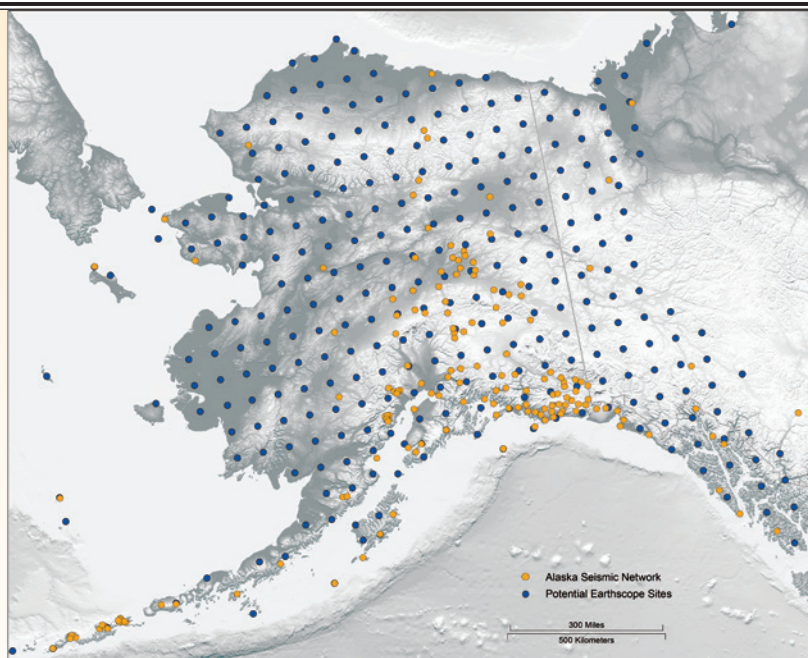
EarthScope in Alaska

The tens of thousands of earthquakes that occur annually in Alaska provide a remarkable dataset to research Earth's crust, volcanic centers and major fault systems. EarthScope, an NSF-funded project, is partnering with the Alaska Earthquake Center to use this data to study the ground beneath our feet, from the crust to the core. Beginning in 2014, a system of 400 portable seismic stations is being placed across Alaska in a grid-like array.

"Alaska is well outside the seismically quiet, stable tectonic interior of North America," said Carl Tape, UAF assistant professor of geophysics. "The array will allow us to better characterize patterns of earthquakes and the style of faulting."

"In regions that have never seen instruments before, we will be discovering fundamental information on how Alaska is deforming in response to plate tectonic stresses."

The Alaska network follows the Lower 48 deployment that began in 2003. Following the 5-year deployment period, each temporary site will be dismantled unless it is adapted into the Earthquake Center's monitoring network.



SEISMOMETERS—The map above shows the location of the current monitoring network in Alaska (yellow) and the temporary EarthScope configuration (blue).